deals with the alleged phosphorescence in flowering plants, and concludes that the cases cited are either counterfeit or due to electrical phenomena (St. Elmo's fire).—WILLIAM CROCKER.

MINOR NOTICES

The nuclei of Protista.—The name "Protista," applied by HAECKER to the lowest animals and plants, has failed to receive general acceptance, even among zoologists, and the forms are found under both the protozoa and unicellular plants. In any consideration of the phylogeny of the nucleus these forms must be of great interest, because the nuclei of the metazoa and of the higher algae and fungi are too highly differentiated to throw much light upon such a subject as the origin of the nucleus. A paper by HARTMAN[5] deals almost entirely with the nucleus of protozoa and its significance as the forerunner of the nucleus of the metazoa. Botanists working with the nucleus in the lower algae and fungi, and especially with flagellates, cannot afford to overlook this paper.—CHARLES J. CHAMBERLAIN.

Symbolae Antillanae.[6]—In continuation of this important work Professor URBAN in cooperation with several eminent specialists has issued the second and third fascicles of the seventh volume. There are included descriptions of approximately 300 new species, several varieties, and a few new combinations. The following new genera are proposed: *Sarcopilea* of the Urticaceae, *Plethadenia* of the Rutaceae, *Hypocoton* of the Euphorbiaceae, *Ottoschulzia* of the Icacinaceae, *Maga* of the Malvaceae, *Poicillopsis* of the Asclepiadaceae, *Tuerckheimocharis* of the Scrophulariaceae, and *Shaferocharis* of the Rubiaceae.—J. M. GREENMAN.

NOTES FOR STUDENTS

Root-tubercles of non-leguminous plants.—In an extremely long and somewhat obscure article, which is not made any clearer by the vague illustrations accompanying it, PEKLO[7] gives an account of his studies of the organisms in the root-tubercles of *Alnus* and *Myrica*. With respect to the morphology of the organisms the author adds nothing to what is known from earlier accounts, especially the excellent account of SHIBATA with which he agrees in all essential details. PEKLO finds in the cells of the root-swellings of *Alnus* and *Myrica* masses of filaments with more or less radial arrangement and termi-

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[5] HARTMAN, MAX, Die Konstitution der Protistenkerne und ihre Bedeutung für die Zellenlehre. 8vo. pp. v+54. *figs. 13*. Jena: Gustav Fischer. 1911.

[6] URBAN, I., Symbolae Antillanae seu fundamenta florae Indiae Occidentalis. Vol. VII, fasc. 2, pp. 161–304, 15 June; fasc. 3, pp. 305–432, 1 October. Leipzig: Fratres Borntraeger. 1912.

[7] PEKLO, J., Die pflanzlichen Aktimonykosen. Centralbl. Bakt. II. **27**:451–579. 1910.

nating in the peculiar vesicles described by BRUNCHORST. Like BRUNCHORST, he regards these vesicles as sporangia and describes the fragmentation of their contents into angular "spores." In the filaments themselves, which finally break up into segments, he finds deeply staining bodies described by SHIBATA, and which resemble the spores of bacteria. These are regarded as endospores, although in his subsequent cultural work he appears to have made no attempt to settle the question of the sporelike nature either of these bodies or of the fragments of the vesicles, by showing that they are capable of germination. In view of SHIBATA'S observation that these bodies as well as the filaments are completely absorbed by the host, it seems that an experimental attempt to determine their true nature would have been worth while, especially since the author seems to have found no difficulty in growing his organisms. The characteristics of the organisms in cultures from both *Alnus* and *Myrica* were similar to those observed in the host cells. The indecisive results of the infection experiments, however, leave some doubt as to whether his cultures contained the causal organisms of the root-galls. From the resemblance of the root-gall fungus of *Alnus* and *Myrica* to the animal parasite *Actinomyces*, PEKLO, following a suggestion made by SHIBATA in regard to the fungus of *Myrica*, transfers these organisms to the genus *Actinomyces*, and rebrands the galls, *Actinomycoses*. All these organisms he believes are highly organized bacteria.

BOTTOMLY[8] studying the root nodules of *Myrica Gale* finds that the bulk of the cortical tissue back of the meristem of the growing apex of the young nodules is infected with bacteria. These are massed together in "infection threads" extending from cell to cell. The bacteria were obtained in pure cultures where they showed the characteristics of *Pseudomonas radicicola*. Cultures grown for seven days at 25° C. showed a fixation of 2.05 mg. nitrogen per 100 cc. It was found that *Myrica* plants growing in sterilized soil deficient in nitrogen did not flourish unless they possessed root nodules. When plants free from root nodules and growing poorly were watered with a culture of the bacteria, nodules developed and the plants began to thrive. Fungus filaments are found in the older parts of the galls, sometimes close to the bacteria-infected cells, but although not denying the possible mycorhizal nature of these filaments which are the organisms described by previous investigators, he believes that they have nothing to do with the origin of the nodules or with nitrogen fixation.

Miss SPRATT[9] confirms former observations of BOTTOMLY, according to which the root-gall organisms of *Alnus* and *Elaeagnus* is a bacterium identical with *Pseudomonas radicicola*. The organism occupies the young cortical tissues

[8] BOTTOMLY, W. B., The root nodules of *Myrica Gale*. Ann. Botany **26**: 111–117. 1912.

[9] SPRATT, ETHEL ROSE, The morphology of the root tubercles of *Alnus* and *Elaeagnus*, and the polymorphism of the organism causing their formation. Ann. Botany **26**: 119–128. 1912.

in a manner similar to that of the organism of *Myrica* described above. Miss SPRATT also finds that under certain conditions, both in the root and in cultures, the organism gives rise to relatively large spherical bodies or coccus forms. This polymorphism seems to be the result of lack of nutrition. When nutriment is supplied they divide and become transformed into typical bacilli. It was also shown that the organisms from both plants were capable of fixing free nitrogen, thus confirming HILTNER'S observations.—H. HASSELBRING.

Morphology of orchids.—VERMOESEN[10] has made a careful study of the development of the ovule in several orchids. He finds arising at the lines of fusion of the three carpels three longitudinal "primary placental protuberances," each of which is caused by the enlargement of a band of subepidermal tissue, usually appearing in cross-section as three cells (possibly from a single one). The lateral members of this band of cells continue to divide actively, while in the median line growth is retarded, resulting in a bifurcation of the placental protuberance. Growth is further checked at various transverse levels, so that the ovary wall soon shows three double rows of small prominences, each with its isolated group of active subepidermal cells. These prominences now branch repeatedly to form the numerous ovulary filaments, each of which finally produces an ovule at its summit. All the steps of this process are initiated by the activity of the subepidermal cells, which retain the characters of archesporial tissue.

The author's main conclusion is that the primary archesporial cells are those which give rise to the original placental protuberance on the wall of the ovary, since this group of cells by repeated dichotomy gives rise to all the tissue within the branched placenta, funiculus, and nucellus. The sterilization idea is extended to include all these organs. It is further held that each carpel originally produced on its ventral surface two marginal archesporial bands which have become fused with those of the neighboring carpels.

The development of an eight-nucleate embryo sac from one megaspore of an "incomplete tetrad" and fertilization occur in the usual manner.—LESTER W. SHARP.

Dioecism in Epigaea.—The flowers of *Epigaea repens* were divided by GRAY into two main groups: one with well developed stigmas and abortive stamens, and the other with small, poorly formed stigmas and well developed stamens. Both groups possess equally good ovaries and ovules, and both show stamens and pistils of various lengths. STEVENS[11] has undertaken to determine two points: (1) whether there is any real evidence of a heterostylic condition, and (2) whether the species is actually dioecious. He finds that

[10] VERMOESEN, CAMILLE, Contribution à l'étude de l'ovule, du sac embryonnaire, et de la fécondation dans les angiospermes. La Cellule **27**:115–162. *pls. 2.* 1911.

[11] STEVENS, NEIL E., Dioecism in the trailing arbutus, with notes on the morphology of the seed. Bull. Torr. Bot. Club. **38**:531–543. *figs. 4.* 1911.